REMARKS

In response to the Office Action, the applicants offer the following remarks.

Amendments

The specification has been amended to correct obvious spelling and punctuation errors and to indicate that "Ketzen black" is not a registered trademark. The paragraph on page 12, lines 10-25, has been amended as indicated because "fluorinated carbon" is obviously not a metallic powder. Support for the amendments to the paragraph on page 25, line 28, to page 26, line 3 and the paragraph on page 26, lines 12-25, is found on page 8, lines 11-12, in Figure 2, and in 3/3, the list of reference numerals filed with the application.

Claims 1-9 have been amended to recite conventional claim terminology, for example, by amending "includes" to conventional transition phrases, by using conventional Markush terminology, and by, where necessary, providing antecedent basis. Claims 1 and 8 have been amended to recite that "each of said composite particles comprises: a central portion consisting essentially of at least one element selected from the group consisting of tin, silicon and zinc. . . . " Support for the amendments to claims 1 and 8 is found on page 8, lines 16-24; page 14, lines 16-22; page 14, line 30, to page 15, line 4; and in Table 1.

If necessary, support for newly presented claims 10-13 is found in Table 1. Support for newly presented claim 14 is found in original claims 1 and 8. Support for newly presented claim 15 is found in original claim 2. Support for newly presented claim 16 is found in Table 1. Support for newly presented claims 17-20 is found in original claims 4-7.

It is submitted that no new matter is introduced by these amendments and new claims.

Copending Applications

1. "Non-Aqueous Electrolyte Secondary Battery," Serial No. 09/601,224, pending in Art Unit 1745, Examiner L. Weiner.

2. "Non-Aqueous Electrolyte Secondary Battery and its Charging

Method," Serial No. 09/601,273, pending in Art Unit 1745, Examiner M. M. Wills.

Supplemental Information Disclosure Statement

A Supplemental Information Disclosure Statement accompanies this response.

Objections to the Drawings

The drawings were objected to because they failed to show "Figure 6" described in the specification. The drawings were also objected to because the reference labels for Figure 2 appeared to be missing. To correct an obvious typographical error, the specification has been amended to refer to "Figure 2" rather than "Figure 6." Figure 2 is described as a vertical cross section of a cylindrical battery of the present invention (page 8, lines 11-12) and "Fig. 6" is described as a vertical cross section of a cylindrical battery of the present invention (page 25, lines 27-28), indicating that they are the same figure.

The reference labels for Figure 2 are found in the paragraph on page 25, line 28, to page 26, line3. The paragraph was amended so that the reference labels agree with those shown in Figure 2, and to describe the insulating gasket. Support for this amendment is found in Figure 2 and in 3/3, the list of reference numerals filed with the application.

It is submitted that these objections have been overcome.

Objections to the Specification

It was alleged that the term "noble" on page 4 was unclear. This objection is respectfully traversed. "Noble potential" is commonly used in the field of electrochemical engineering to indicate a high potential. See, for example, column 5, line 6, and the Abstract of U.S. Patent 5,053,297, a copy of which is enclosed for the Examiner's convenience. See also column 9, lines 29-39, of U.S. Patent 6,218,046, a copy of which is enclosed for the Examiner's convenience.

The title was objected to as allegedly not descriptive of the invention. A new title has been provided.

The use of "Ketzen Black" in the specification was objected to. The United States Patent and Trademark Office trademark database (available at uspto.gov) does not list "Ketzen Black" as a registered trademark in the United States. The specification has been amended accordingly. It is submitted that this objection has been overcome.

The amendment of 7/31/2000 was objected to as allegedly containing new matter. Applicants respectfully disagree. However, in order to expedite prosecution, page 4, lines 5-27, have been reamended. it is submitted that this objection has been overcome.

Objections to the Claims

Claims 2 and 7 were objected to. Claims 2 and 7 have been amended. It is submitted that these objections have been overcome.

Rejection under 35 U.S.C. § 112, ¶ 2

Claims 3-5, 8, and 9 were rejected to under 35 U.S.C. § 112, ¶ 2. Claim 1, from which claims 3-5 depend, and claims 3-5, 8, and 9 have been amended. It is submitted that these rejections have been overcome.

Rejection under 35 U.S.C. § 102(a)

Claims 1 and 3 were rejected under 35 U.S.C. § 102(a) as anticipated by the computed-generated English translation of JP 10-0982,424 ("JP 10-0982,424").

JP 10-0982,424 discloses a secondary battery negative electrode. Title. The battery comprises aluminum powder having conductive inorganic coating layers on the surfaces thereof as the negative electrode active material. Abstract. An alloy of aluminum with Si, Zn, In, Ag, Te, Mg, Pb, Bi, or Sn, comprising 30 to 99% of aluminum may be used. Page 2, lines 1-5. The conductive coating ("conductive inorganic enveloping layer") may be, for example, Pb-Sn or Ag-Mn-Sn. Page 2, lines 16-19.

Claim 1, as amended, recites that each of the composite particles comprises a central portion consisting essentially of at least one element selected from the group consisting of tin, silicon and zinc. Although the central portion may contain

a trace of aluminum, and/or traces of other elements (specification, page 14, lines 20-23, and page 15, lines 4-5), it does not contain 30 to 99% of aluminum disclosed by JP 10-0982,424.

It is axiomatic that for a prior art reference to anticipate under § 102 it has to meet every element of the claimed invention. . . ." Hybritech Inc. v. Monoclonal Antibodies, Inc., 231 U.S.P.Q. 81, 90 (Fed. Cir. 1980) (emphasis added). JP 10-0982,424 does not disclose a battery in which the negative electrode comprises composite particles comprising a central portion consisting essentially of at least one element selected from the group consisting of tin, silicon and zinc. It is submitted that the rejection of claims 1 and 3 under 35 U.S.C. § 102(a) as anticipated by JP 10-0982,424 has been overcome.

First Rejection under 35 U.S.C. § 103(a)

Claims 2-4 were rejected under 35 U.S.C. § 103(a) as unpatentable over JP 10-0982,424 in view of EP 0 730 316 A1.

EP 730316 A1 discloses a polymeric electrode and electrolyte. Title. One of the electrodes or an absorber-separator comprises a porous polyvinylidene fluoride. Abstract.

As discussed above, claim 1, on which claims 2-4 depend, as amended, recites that each of the composite particles comprises a central portion consisting essentially of at least one element selected from the group consisting of tin, silicon and zinc. This feature is not disclosed or suggested by JP 10-0982,424. EP 730316 A1 does not overcome this deficiency. Thus, combination of the references in the manner indicated does not produce applicants' invention. The rejection of claims 2-4 as unpatentable over JP 10-0982,424 in view of EP 0 730 316 A1 has been overcome.

Second Rejection under 35 U.S.C. § 103(a)

Claim 7 was rejected under 35 U.S.C. § 103(a) as unpatentable over JP 10-0982,424 in view of Gies, U.S. Patent 5,665,265 ("Gies").

Gies discloses a non-woven gel electrolyte for electrochemical cells. Title. Gies discloses that the negative electrode of his electrochemical cell can be fabricated from any of a number of electrode materials known to those skilled in the art. Column 2, lines 55-67.

As discussed above, claim 1, on which claim 7 depends, as amended, recites that each of the composite particles comprises a central portion consisting essentially of at least one element selected from the group consisting of tin, silicon and zinc. This feature is not disclosed or suggested by JP 10-0982,424. Gies does not overcome this deficiency. Thus, combination of the references in the manner indicated does not produce applicants' invention. The rejection of claim 7 as unpatentable over JP 10-0982,424 in view of Gies has been overcome.

Third Rejection under 35 U.S.C. § 103(a)

Claims 6 and 7 were rejected under 35 U.S.C. § 103(a) as unpatentable over JP 10-0982,424 in view of EP 0 730 316 A1 as applied to claim 2 and further in view of Gies.

As discussed above, claim 1, on which claims 6 and 7 depend, as amended, recites that each of the composite particles comprises a central portion consisting essentially of at least one element selected from the group consisting of tin, silicon and zinc. This feature is not disclosed or suggested by JP 10-0982,424. Neither EP 0 730 316 A1 nor Gies, nor the combination thereof, overcomes this deficiency. Thus, combination of the references in the manner indicated does not produce applicants' invention. The rejection of claims 6 and 7 as unpatentable over JP 10-0982,424 in view of in view of EP 0 730 316 A1 as applied to claim 2 and further in view of Gies has been overcome.

Fourth Rejection under 35 U.S.C. § 103(a)

Claim 5 was rejected under 35 U.S.C. § 103(a) as unpatentable over JP 10-0982,424 in view of EP 0 730 316 A1 as applied to claim 2 and further in view of St. Aubyn Hubbard, U.S. Patent 5,460,903 ("St. Aubyn Hubbard").

St. Aubyn Hubbard discloses ionically conductive polymer gels. Title. The gel is prepared by dissolving a lithium salt in an organic compound and adding a

polymer, such as polyethylene terephthalate, that provides mechanical rigidity. Abstract.

As discussed above, claim 1, on which claim 5 depends, as amended, recites that each of the composite particles comprises a central portion consisting essentially of at least one element selected from the group consisting of tin, silicon and zinc. This feature is not disclosed or suggested by JP 10-0982,424. St. Aubyn Hubbard does not overcome this deficiency. Thus, combination of the references in the manner indicated does not produce applicants' invention. The rejection of claim 5 as unpatentable over JP 10-0982,424 in view of in view of St. Aubyn Hubbard has been overcome.

Fifth Rejection under 35 U.S.C. § 103(a)

Claims 8 and 9 were rejected under 35 U.S.C. § 103(a) as unpatentable over JP 10-0982,424 in view of Iwamoto, U.S. Patent 5,589,296 ("Iwamoto").

Iwamoto discloses an ion conductive fibrous solid electrolyte. Abstract. The lithium ion conductive glassy solid electrolyte is synthesized from a combination of lithium sulfide, at least one member selected from the group consisting of silicon disulfide, diphosphorus pentasulfide and boron sulfide and at least one member selected from the group consisting of lithium phosphate, lithium sulfate, lithium orthosilicate and lithium oxide. Column 2, lines 52-58.

Claim 8, on which claim 9 depends, as amended, recites that each of the composite particles comprises a central portion consisting essentially of at least one element selected from the group consisting of tin, silicon and zinc. This feature is not disclosed or suggested by JP 10-0982,424. Iwamoto does not overcome this deficiency. Thus, combination of the references in the manner indicated does not produce applicants' invention. The rejection of claims 8 and 9 as unpatentable over JP 10-0982,424 in view of in view of Iwamoto has been overcome.

Double Patenting Rejection under 35 U.S.C. § 103(a)

Claim 1 was provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-3 of

copending application Serial No. 09/601,421. A Terminal Disclaimer accompanies this response.

Newly Presented Claim 14 and the Claims Dependent Thereon

Newly presented claim 14 recites a battery in which the negative electrode comprises composite particles that comprise a central portion comprising silicon, and a coating at least partially around said central portion comprising a solid solution or an inter-metallic compound comprising a) silicon, and b) at least one additional element selected from the group consisting of group 2 elements, transition elements, group 12 elements, group 13 elements, and group 14 elements exclusive of carbon and silicon.

JP 10-0982,424 does not disclose an "enveloping layer" comprising a solid solution or an inter-metallic compound comprising a) silicon, and b) at least one additional element selected from the group consisting of group 2 elements, transition elements, group 12 elements, group 13 elements, and group 14 elements exclusive of carbon and silicon. It is submitted that newly presented claim 14, and the claims dependent thereon, are patentable over the art of record.

Extension of Time

A check for a one-month extension of time accompanies this response. Pursuant to 37 C.F.R. § 1.136(a)(3), the Assistant Commissioner is requested to treat this payment as a constructive Petition for an Extension of Time. A separate Petition for an Extension of Time has not been enclosed. The Assistant Commissioner is hereby authorized to charge any additional fee required in connection with this response and to credit any overpayment to Deposit Account No. 18-0350 (Ratner & Prestia).

CONCLUSION

It is respectfully submitted that the claims are in condition for immediate allowance and a notice to this effect is earnestly solicited. The Examiner is invited to phone applicants' attorney if it is believed that a telephonic or personal interview would expedite prosecution of this application.

Respectfully submitted,

Lawrence E. Ashery, Reg. No. 34,515
Bruce M. Monroe, Reg. No. 33,602
Attorneys for Applicants

BMM/lm
Enclosure: Version With Markings Showing Changes Made
Supplemental IDS w/Form PTO-1449
Terminal Disclaimer
Extension of Time
U.S. Patent No. 5,053,297
U.S. Patent No. 6,218,046

Dated: May 16, 2002
Suite 301
One Westlakes, Berwyn
P.O. Box 980
Valley Forge, PA 19482-0980
(610) 407-0700

The Assistant Commissioner for Patents is hereby authorized to charge payment to Deposit Account No. 18-0350 of any fees associated with this communication.

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Assistant Commissioner for Patents, Washington, D.C. 20231 on:

May 16, 2002

VERSION WITH MARKINGS SHOWING CHANGES MADE

TITLE

The Title, page 1, line 1, has been amended as follows:

[Non-aqueous electrolyte secondary battery] NON-AQUEOUS ELECTROLYTE SECONDARY BATTERY COMPRISING COMPOSITE PARTICLES

SPECIFICATION:

Specification at page 4, line 5:

If graphite-group carbon materials are used as a negative electrode material, and propylene carbonate is adopted for an electrolytic solution, the electrolytic solution is decomposed at potentials more [noble] precious than that of lithium metal. Consequently, lithium ions are not intercalated between layers of graphite, and the battery does not function. Considering these points, currently commercialized lithium secondary batteries with the graphite-group used for negative electrode materials frequently use electrolytic solution containing ethylene carbonate. However, the melting point of ethylene carbonate is 37°C higher than room temperature. Therefore, at low temperatures, ionic conductivity of the electrolytic solution for lithium ions plummets, lowering charge/discharge priorities.

Specification at page 4, line 17:

When inorganic compound materials such as TiS2 are used as a negative electrode active material, intercalation and de-intercalation of lithium occur at sufficiently more [noble] precious potentials compared with lithium metal and lithium alloys. Thus, even when the negative electrode active materials come in contact with the electrolytic solution, reductive decomposition does not occur. Moreover, even when propylene carbonate is used for the electrolytic solution, intercalation and de-intercalation are not impeded by decomposition as [it] is the case with the graphite materials, therefore, a wider range of electrolytic solutions

[are] is applicable. However, potentials of the negative electrode using the foregoing inorganic compound materials is [noble] precious, causing voltage of the battery to inevitably become low. This is a disadvantage of achieving higher energy density.

Specification at page 10, line 12:

As a conductive material for the negative electrode, any electronic conduction materials can be used. Examples of such materials include graphite materials including natural graphite (scale-like graphite), synthetic graphite and expanding graphite; carbon blacks such as acetylene black, Ketzen black ([registered trademark of] highly structured furnace black), channel black, furnace black, lamp black and thermal black; conductive fibers such as carbon fibers and metallic fibers; metal powders such as copper and nickel; and organic conductive materials such as polyphenylene derivatives. These materials can be used independently or in combination. Among these conductive materials, synthetic graphite, acetylene black and carbon fibers are especially favorable.

Specification at page 12, line 12:

Conductive materials for the positive electrode can be any electronic conductive material on the condition that it does not chemically change within the range of charge and discharge electric potentials of the positive electrode materials in use. Examples of such materials include graphite materials including natural graphite (scale-like graphite) and synthetic graphite; carbon black materials such as acetylene black, Ketzen black, channel black, furnace black, lamp black and thermal black; conductive fibers such as carbon fibers and metallic fibers; fluorinated carbon; metal powders such as [fluorinated carbon and] aluminum; conductive whiskers such as a zinc oxide and potassium titanate, conductive metal oxides such as a titanium oxide, and organic conductive materials such as polyphenylene derivatives. These materials can be used independently or in combination. Among these conductive materials, synthetic graphite and acetylene black are especially favorable. The total amount of the conductive materials to be added is not specifically defined, however, 1-50wt%, especially 1-30% of the positive electrode materials is desirable. In the case of carbon and graphite, 2-15 wt% is especially favorable.

Specification at page 25, line 13:

Subsequently, a solution comprising a mixed solution of ethylene glycol dimethacrylate and polyethylene oxides of molecular weight of 10,000 or less , the organic electrolytic solution, the same as that of the first preferred embodiment, a photo-polymerization [initiater] initiator and a polypropylene filler, used as a structural reinforcement, is cast on the positive and the negative plates. Ultraviolet lights are then irradiated onto the electrode plates in an argon atmosphere. In this manner, the material with the foregoing composition is photo-polymerized directly to form a gel electrolyte layer (PMMA-PEO) on the surfaces of the electrode plates, which are then laminated.

Specification at page 26, line 1:

Fig. [6] 2 shows a vertical cross section of a cylindrical battery of the present invention. The positive electrode plate [5] 15 and the negative electrode plate [6] 16 are spirally rolled a plurality of times via the separator [7] 17, and placed in the battery casing [1] 11. Coming out from the positive electrode plate [5] 15 is a positive electrode lead [5a] 15a, which is connected to a sealing plate [2] 12. In the same manner, a negative electrode lead [6a] 16a comes out from a negative electrode plate [6] 16, and is connected to the bottom of the battery casing [1] 11. Insulating gasket 13 separates sealing plate 12 from battery casing 11.

Specification at page 26, line 16:

Insulating rings [8] 18 are disposed on the top and the bottom of an electrode plate group [4] 14. A safety valve can be used as a sealing plate. Apart from the safety valve, other conventionally used safety elements can be adopted. As an anti-overcurrent element, for example, fuses, bimetal and PTC elements can be used. To deal with increases in internal pressure of the battery casing, a cut can be provided to the battery casing, a gasket cracking method or a sealing plate cracking method can be applied, or the connection to the lead plate can be severed. As other methods, a protective circuit incorporating anti-overcharging and anti-overdischarging systems, can be included in or connected independently to a charger. As an anti-overcharging method, a system to cut off a current by utilizing an increase in internal pressure of the battery is used. In this case, a compound

[which] that raises internal pressure can be mixed with the composites or with the electrolytes. Such compounds include carbonates such as Li2CO3, LiHCO3, Na2CO3, NaHCO3, CaCO2 and MgCO3.

Specification at page 27, line 21:

Subsequently, 2wt% of PTFE is added to [98we%] 98wt% of the solid electrolyte powder and mixed thoroughly in a mortar to make it elastic. The elastic body is then pressed and rolled by a roller, and a solid electrolytic sheet is obtained.

CLAIMS:

The claims have been amended as follows:

1. (Twice Amended) A non-aqueous electrolyte secondary battery comprising[;]:

a positive electrode,

[and] a negative electrode capable of intercalating and de-intercalating lithium[;],

a non-aqueous electrolyte solution[;], and

[a solid electrolyte] a polymer gel electrolyte, said polymer gel electrolyte comprising a polymer,

wherein:

said negative electrode [includes] comprises a plurality of composite particles,

each of said composite [particle includes] particles comprises: a central portion [containing] consisting essentially of at least one [of] element selected from the group consisting of tin, silicon, and zinc; and a coating at least partially around said central portion,

said coating [including] comprises [at least one of] a solid solution [and] or

an inter-metallic compound [containing], and

said solid solution or inter-metallic compound comprises: a) at least one [of] element selected from the group consisting of tin, silicon, and zinc, and b) at least one additional element, said additional element selected from the group consisting of group 2 elements, transition elements, group 12 elements, group 13 elements and group 14 elements exclusive of carbon and exclusive of said element selected from the group consisting of tin, silicon, and zinc in said solid solution or inter-metallic compound[; wherein said solid electrolyte is a polymer gel electrolyte].

2. (Once Amended) The non-aqueous electrolyte secondary battery of claim 1, wherein said positive electrode [includes] comprises a lithium-containing composite oxide and [a] said polymer [composing said polymer gel electrolyte], and said negative [electrolyte includes] electrode comprises said composite [particle] particles and [a] said polymer [composing said polymer gel electrolyte].

3. (Once Amended) The non-aqueous electrolyte secondary battery of [one of] claim 1[and] or claim 2, wherein [main structure of] said polymer is [one of] a polyalkylene oxide [and a derivative of the same].

4. (Twice Amended) The non-aqueous electrolyte secondary battery of [one of] claim 1[and] or claim 2, wherein said polymer is [one of] a polymer [and] or a copolymer [including] comprising at least one monomer selected from the group consisting of acrylonitrile, vinylidene fluoride, hexafluoro-propylene, tetrafluoro-ethylene, and perfluoro-alkyl vinyl ether.

5. (Twice Amended) The non-aqueous electrolyte secondary battery of [one of] claim 1[and] or claim 2, wherein said polymer is a polyester [polymer whose structure is one of polyester and a derivative of the same].

6. (Once Amended) The non-aqueous electrolyte secondary battery of [one of] claim 1[and] or claim 2, wherein said polymer is a copolymer of a methacrylate and an ethylene oxide.

7. (Once Amended) The non-aqueous electrolyte secondary battery of [one of] claim 1 [and] or claim 2, wherein said polymer gel electrolyte [includes]

comprises at least one [of] structural [reinforcements] reinforcement selected from the group consisting of [a] hydrophobic treated [particulate] particulates, [and a]fiber fabrics of polyolefin polymers, and [or a] non-woven [fabric of a] fabrics of polyolefin polymers.

8. (Twice Amended) A non-aqueous electrolyte secondary battery comprising[;]:

a positive electrode,

[and] a negative electrode capable of intercalating and de-intercalating lithium[;],

a non-aqueous electrolyte solution[;], and

[a solid electrolyte] a lithium ion conductive glass solid electrolyte,

wherein:

said negative electrode [includes] comprises a plurality of composite particles,

each of said composite [particle includes] particles comprises: a central portion [containing] consisting essentially of at least one [of] element selected from the group consisting of tin, silicon, and zinc; and a coating at least partially around said central portion,

said coating [including] comprises at least one of a solid solution and an inter-metallic compound [containing], and

said solid solution or inter-metallic compound comprises: a) at least one [of] element selected from the group consisting of tin, silicon, and zinc, and b) at least one additional element, said additional element selected from the group consisting of group 2 elements, transition elements, group 12 elements, group 13 elements and group 14 elements exclusive of carbon, and exclusive of said at least one element selected from the group consisting of tin, silicon, and zinc in said solid solution or inter-metallic compound [wherein said solid electrolyte is a lithium ion conductive glass-type solid electrolyte].

9. (Once Amended) The non-aqueous electrolyte secondary battery of claim 8, wherein said lithium ion conductive glass[-type] solid electrolyte is synthesized [with row materials including;] from:

a first component [including at least] comprising a lithium sulfide;

a second component [including at least one of] comprising a silicon sulfide, a phosphor sulfide [and] or a boron sulfide; and

a third component [including at least one of] comprising lithium phosphate, lithium sulfate, lithium borate, or lithium silicate.

Claims 10-20 are newly added.